

What is claimed is:

1. A tactile pin holding apparatus comprising:

a holding member having a tactile surface and a first
number of holes, and being provided for supporting the first
5 number of tactile pins in the holes, respectively, to be
movable up-and-down therein relative to the tactile surface
for displaying characters and/or graphics, the tactile pins
being arranged in multi-row multi-column and in a second
number of groups at the tactile surface, the second number
10 being smaller than the first number; and

elastic members, in the second number, respectively
corresponding to the second number of groups of tactile pins
and being arranged at the holding member for pressing and
holding the tactile pins with the holding member in a manner
15 that each of the tactile pins in each of the groups of tactile
pins is pressed at one side thereof by the elastic member
corresponding to the each of the groups of tactile pins and
can thereby be held at a desired height relative to the
tactile surface, and that the each of the tactile pins is
20 movable up-and-down when a force exceeding a given value is
applied to the each of the tactile pins in up-and-down
direction.

2. The tactile pin holding apparatus according to claim 1,
wherein the second number is the number of rows of tactile
25 pins, and each of the elastic members provided for each of the

rows of tactile pins is an elastic ring placed annularly at the holding member for pressing, at one side thereof, and holding each of the tactile pins in the each of the rows.

3. The tactile pin holding apparatus according to claim 1,
5 wherein the second number is equal to half of the number of columns of tactile pins, and each of the elastic members is an elastic rod extending in column direction and being sandwiched between a pair of adjacent columns of tactile pins in a manner that the tactile pins in one column of the pair of columns are
10 pressed and held by one side of the elastic rod, and the tactile pins in the other column are pressed and held by the opposite side of the elastic rod.

4. The tactile pin holding apparatus according to claim 1,
wherein the second number is equal to half of the number of
15 tactile pins, and each of the elastic members is an elastic segment sandwiched between a pair of adjacent tactile pins in each row in a manner that one of the pair of tactile pins is pressed and held by one side of the elastic segment, and the other tactile pin is pressed and held by the opposite side of
20 the elastic segment.

5. The tactile pin holding apparatus according to claim 1,
wherein the each of the tactile pins in the each of the groups of tactile pins has an annular groove for engagement with the elastic member corresponding to the each of the groups of
25 tactile pins.

6. The tactile pin holding apparatus according to claim 1, wherein the holding member is disc-shaped, drum-shaped or conveyor-shaped.

7. The tactile pin holding apparatus according to claim 1, wherein each of the elastic members is a non-metal ring-shaped member, a non-metal rod-shaped member, a non-metal tube-shaped member or a compression coil spring.

8. A tactile pin holding apparatus comprising:

a holding member having a tactile surface and a first number of holes, and being provided for supporting the first number of tactile pins in the holes, respectively, to be movable up-and-down therein relative to the tactile surface for displaying characters and/or graphics, the tactile pins being arranged in multi-row multi-column and in a second number of groups at the tactile surface, the second number being smaller than the first number; and

elastic members, in the second number, respectively corresponding to the second number of the groups of tactile pins and being arranged at the holding member for pressing and holding the tactile pins with the holding member in a manner that each of the tactile pins in each of the groups of tactile pins is pressed at one side thereof by the elastic member corresponding to the each of the groups of tactile pins,

wherein each of the holes comprises an engagement portion, and each of the tactile pins in the each of the holes

comprises a step portion engageable with the engagement portion of the each of the holes, such that when the step portion of the each of the tactile pins is engaged with the engagement portion of the each of the holes, the each of the tactile pins is held at a desired height relative to the tactile surface.

9. The tactile pin holding apparatus according to claim 8, which further comprises engagement release members each for being coupled to each of the tactile pins for releasing the engagement between the step portion of the each of the tactile pins and the engagement portion of the each of the holes.

10. The tactile pin holding apparatus according to claim 8, wherein the second number is the number of rows of tactile pins, and each of the elastic members provided for each of the rows of tactile pins is an elastic ring placed annularly at the holding member for pressing, at one side thereof, and holding each of the tactile pins in the each of the rows.

11. The tactile pin holding apparatus according to claim 8, wherein the second number is equal to half of the number of columns of tactile pins, and each of the elastic members is an elastic rod extending in column direction and being sandwiched between a pair of adjacent columns of tactile pins in a manner that the tactile pins in one column of the pair of columns are pressed and held by one side of the elastic rod, and the tactile pins in the other column are pressed and held by the

opposite side of the elastic rod.

12. The tactile pin holding apparatus according to claim 8, wherein the second number is equal to half of the number of tactile pins, and each of the elastic members is an elastic segment sandwiched between a pair of adjacent tactile pins in each row in a manner that one of the pair of tactile pins is pressed and held by one side of the elastic segment, and the other tactile pin is pressed and held by the opposite side of the elastic segment..

13. The tactile pin holding apparatus according to claim 8, wherein the each of the tactile pins in the each of the groups of tactile pins has an annular groove for engagement with the elastic member corresponding to the each of the groups of tactile pins

14. The tactile pin holding apparatus according to claim 8, wherein the holding member is disc-shaped, drum-shaped or conveyor-shaped.

15. The tactile pin holding apparatus according to claim 8, wherein each of the elastic members is a non-metal ring-shaped member, a non-metal rod-shaped member, a non-metal tube-shaped member or a compression coil spring.

16. A tactile pin holding apparatus comprising:

a holding member having a tactile surface and holes, and being provided for supporting tactile pins in the holes,

respectively, to be movable up-and-down therein relative to

the tactile surface for displaying characters and/or graphics;
and

ring-shaped elastic members, each being arranged in each
of the holes of the holding member and having each of the
5 tactile pins fitly inserted therein for pressing and holding
the each of the tactile pins with the holding member at a
desired height relative to the tactile surface, wherein the
each of the tactile pins is movable up-and-down in the each of
the holes when a force exceeding a given value is applied to
10 the each of the tactile pins in up-and-down direction.

17. The tactile pin holding apparatus according to claim
16, wherein each of the tactile pins in each of the holes has
an annular groove for engagement with the elastic member
arranged in the each of the holes.

15 18. The tactile pin holding apparatus according to claim
16, wherein the holding member is disc-shaped, drum-shaped or
conveyor-shaped.

19. A tactile pin display apparatus comprising:

a rotational member having a tactile surface and a first
20 number of holes, and being provided for supporting the first
number of tactile pins in the holes, respectively, to be
movable up-and-down therein relative to the tactile surface
for displaying characters and/or graphics, the tactile pins
being arranged in multi-row multi-column and in a second
25 number of groups at the tactile surface, the second number

being smaller than the first number;

elastic members, in the second number, respectively
corresponding to the second number of groups of tactile pins
and being arranged at the rotational member for pressing and
5 holding the tactile pins with the rotational member in a
manner that each of the tactile pins in each of the groups of
tactile pins is pressed at one side thereof by the elastic
member corresponding to the each of the groups of tactile pins
and can thereby be held at a desired height relative to the
10 tactile surface, and that the each of the tactile pins is
movable up-and-down when a force exceeding a given value is
applied to the each of the tactile pins in up-and-down
direction;

rotation driving means coupled to the rotational member
15 for rotating the rotational member;

a pin height reset member provided nearby the rotational
member for resetting the height of the tactile pins at a reset
height when the tactile pins are brought to contact with the
pin height reset member during the rotation of the rotational
20 member;

actuators provided nearby the rotational member for
moving the tactile pins; and

selectively driving means coupled to the actuators for
selectively driving the actuators to selectively move the
25 tactile pins to be positioned at desired heights, respectively,

relative to the tactile surface.

20. The tactile pin display apparatus according to claim 19, wherein the second number is the number of rows of tactile pins, and each of the elastic members provided for each of the 5 rows of tactile pins is an elastic ring placed annularly at the rotational member for pressing, at one side thereof, and holding each of the tactile pins in the each of the rows.

21. The tactile pin display apparatus according to claim 19, wherein the second number is equal to half of the number 10 of columns of tactile pins, and each of the elastic members is an elastic rod extending in column direction and being sandwiched between a pair of adjacent columns of tactile pins in a manner that the tactile pins in one column of the pair of columns are pressed and held by one side of the elastic rod, 15 and the tactile pins in the other column are pressed and held by the opposite side of the elastic rod.

22. The tactile pin display apparatus according to claim 19, wherein the second number is equal to half of the number of tactile pins, and each of the elastic members is an elastic 20 segment sandwiched between a pair of adjacent tactile pins in each row in a manner that one of the pair of tactile pins is pressed and held by one side of the elastic segment, and the other tactile pin is pressed and held by the opposite side of the elastic segment.

25 23. The tactile pin display apparatus according to claim

19, wherein the each of the tactile pins in the each of the groups of tactile pins has an annular groove for engagement with the elastic member corresponding to the each of the groups of tactile pins.

5 24. The tactile pin display apparatus according to claim 19, wherein the rotational member is disc-shaped, drum-shaped or conveyor-shaped.

10 25. The tactile pin display apparatus according to claim 19, wherein each of the elastic members is a non-metal ring-shaped member, a non-metal rod-shaped member, a non-metal tube-shaped member or a compression coil spring.

15 26. The tactile pin display apparatus according to claim 19, wherein the number of the actuators is equal to the number of rows of tactile pins, and the actuators are placed distantly from each other.

20 27. The tactile pin display apparatus according to claim 19, wherein the number of the actuators is equal to the number of rows of tactile pins, and the actuators are driven at timings respectively different from each other.

25 28. The tactile pin display apparatus according to claim 19, which further comprises an abnormal load detecting means for detecting an abnormal load applied to the rotational member.

29. The tactile pin display apparatus according to claim 19, which further comprises an indicator portion provided

nearby the rotational member for a user to put its finger at for touching the tactile pins.

30. The tactile pin display apparatus according to claim 19, wherein photocatalytic function is provided to at least the rotational member or the tactile pins.

31. A tactile pin display apparatus comprising:

a rotational member having a tactile surface and a first number of holes, and being provided for supporting the first number of tactile pins in the holes, respectively, to be movable up-and-down therein relative to the tactile surface for displaying characters and/or graphics, the tactile pins being arranged in multi-row multi-column and in a second number of groups at the tactile surface, the second number being smaller than the first number;

elastic members, in the second number, respectively corresponding to the second number of groups of tactile pins and being arranged at the rotational member for pressing and holding the tactile pins with the rotational member in a manner that each of the tactile pins in each of the groups of the tactile pins is pressed at one side thereof by the elastic member corresponding to the each of the groups of tactile pins,

wherein each of the holes comprises an engagement portion, and each of the tactile pins in the each of the holes comprises a step portion engageable with the engagement portion of the each of the holes, such that when the step

portion of the each of the tactile pins is engaged with the engagement portion of the each of the holes, the each of the tactile pins is held at a desired height relative to the tactile surface;

5 rotation driving means coupled to the rotational member for rotating the rotational member;

a pin height reset member provided nearby the rotational member for resetting the height of the tactile pins at a reset height when the tactile pins are brought to contact with the
10 pin height reset member during the rotation of the rotational member;

engagement release members each being brought to contact with each of the tactile pins in each of the holes, during the rotation of the rotational member, for releasing the
15 engagement between the step portion of the each of the tactile pins and the engagement portion of the each of the holes, the engagement release members being placed upstream of the pin height reset member in the rotation of the rotational member;

actuators provided nearby the rotational member for
20 moving the tactile pins; and

selectively driving means coupled to the actuators for selectively driving the actuators to selectively move the tactile pins to be positioned at desired heights, respectively, relative to the tactile surface.

25 32. The tactile pin display apparatus according to claim

31, wherein the second number is the number of rows of tactile pins, and each of the elastic members provided for each of the rows of tactile pins is an elastic ring placed annularly at the rotational member for pressing, at one side thereof, and
5 holding each of the tactile pins in the each of the rows.

33. The tactile pin display apparatus according to claim 31, wherein the second number is equal to half of the number of columns of tactile pins, and each of the elastic members is an elastic rod extending in column direction and being
10 sandwiched between a pair of adjacent columns of tactile pins in a manner that the tactile pins in one column of the pair of columns are pressed and held by one side of the elastic rod, and the tactile pins in the other column are pressed and held by the opposite side of the elastic rod.

15 34. The tactile pin display apparatus according to claim 31, wherein the second number is equal to half of the number of tactile pins, and each of the elastic members is an elastic segment sandwiched between a pair of adjacent tactile pins in each row in a manner that one of the pair of tactile pins is
20 pressed and held by one side of the elastic segment, and the other tactile pin is pressed and held by the opposite side of the elastic segment.

35. The tactile pin display apparatus according to claim 31, wherein the each of the tactile pins in the each of the
25 groups of tactile pins has an annular groove for engagement

with the elastic member corresponding to the each of the groups of tactile pins.

36. The tactile pin display apparatus according to claim 31, wherein the rotational member is disc-shaped, drum-shaped
5 or conveyor-shaped.

37. The tactile pin display apparatus according to claim 31, wherein each of the elastic members is a non-metal ring-shaped member, a non-metal rod-shaped member, a non-metal tube-shaped member or a compression coil spring.

10 38. The tactile pin display apparatus according to claim 31, wherein the number of the actuators is equal to the number of rows of tactile pins, and the actuators are placed distantly from each other.

39. The tactile pin display apparatus according to claim
15 31, wherein the number of the actuators is equal to the number of rows of tactile pins, and the actuators are driven at timings respectively different from each other.

40. The tactile pin display apparatus according to claim
20 31, wherein the number of the engagement release members is equal to the number of rows of tactile pins.

41. The tactile pin display apparatus according to claim 31, which further comprises abnormal load detecting means for detecting an abnormal load applied to the rotational member.

42. The tactile pin display apparatus according to claim
25 31, which further comprises an indicator portion provided

nearby the rotational member for a user to put its finger at
for touching the tactile pins.

43. The tactile pin display apparatus according to claim
31, wherein photocatalytic function is provided to at least
5 the rotational member or the tactile pins.

44. A tactile pin display apparatus comprising:

a rotational member having a tactile surface and holes,
and being provided for supporting tactile pins in the holes,
respectively, to be movable up-and-down therein relative to
10 the tactile surface for displaying characters and/or graphics,
the tactile pins being arranged in multi-row multi-column at
the tactile surface;

ring-shaped elastic members, each being arranged in each
of the holes of the rotational member and having each of the
15 tactile pins fitly inserted therein for pressing and holding
the each of the tactile pins with the rotational member at a
desired height relative to the tactile surface, wherein the
each of the tactile pins is movable up-and-down in the each of
the holes when a force exceeding a given value is applied to
20 the each of the tactile pins in up-and-down direction;

rotation driving means coupled to the rotational member
for rotating the rotational member;

a pin height reset member provided nearby the rotational
member for resetting the height of the tactile pins at a reset
25 height when the tactile pins are brought to contact with the

pin height reset member during the rotation of the rotational member;

actuators provided nearby the rotational member for moving the tactile pins; and

5 selectively driving means coupled to the actuators for selectively driving the actuators to selectively move the tactile pins to be positioned at desired heights, respectively, relative to the tactile surface.

45. The tactile pin display apparatus according to claim
10 44, wherein each of the ring-shaped elastic members is a non-metal ring-shaped member, a non-metal rod-shaped member, a non-metal tube-shaped member or a compression coil spring.

46. The tactile pin display apparatus according to claim
15 44, wherein each of the tactile pins in each of the holes has an annular groove for engagement with the elastic member arranged in the each of the holes.

47. The tactile pin display apparatus according to claim 44, wherein the rotational member is disc-shaped, drum-shaped or conveyor-shaped.

20 48. The tactile pin display apparatus according to claim 44, wherein the number of the actuators is equal to the number of rows of tactile pins, and the actuators are placed distantly from each other.

49. The tactile pin display apparatus according to claim
25 44, wherein the number of the actuators is equal to the number

of rows of tactile pins, and the actuators are driven at timings respectively different from each other.

50. The tactile pin display apparatus according to claim 44, which further comprises abnormal load detecting means for detecting an abnormal load applied to the rotational member.

51. The tactile pin display apparatus according to claim 44, which further comprises an indicator portion provided nearby the rotational member for a user to put its finger at for touching the tactile pins.

52. The tactile pin display apparatus according to claim 44, wherein photocatalytic function is provided to at least the rotational member or the tactile pins.

53. A tactile pin display apparatus comprising:

a rotational member having a tactile surface and holes, and being provided for supporting tactile pins in the holes, respectively, to be movable up-and-down therein relative to the tactile surface for displaying characters and/or graphics, the tactile pins being arranged in multi-row multi-column at the tactile surface and each having an annular groove;

elastic cantilevers, each being arranged in correspondence with each of the holes of the rotational member and each having an engagement portion engageable with the annular groove of the each of the tactile pins for pressing and holding the each of the tactile pins with the rotational member,

wherein the each of the tactile pins is movable up-and-down in the each of the holes when a force exceeding a given value is applied to the each of the tactile pins in up-and-down direction;

5 rotation driving means coupled to the rotational member for rotating the rotational member;

a pin height reset member provided nearby the rotational member for resetting the height of the tactile pins at a reset height when the tactile pins are brought to contact with the
10 pin height reset member during the rotation of the rotational member;

actuators provided nearby the rotational member for moving the tactile pins; and

selectively driving means coupled to the actuators for
15 selectively driving the actuators to selectively move the tactile pins to be positioned at desired heights, respectively, relative to the tactile surface.

54. A tactile pin display apparatus comprising:

a rotational member having a tactile surface and first
20 holes, and being provided for supporting tactile pins in the first holes, respectively, to be movable up-and-down therein relative to the tactile surface for displaying characters and/or graphics, the tactile pins being arranged in multi-row multi-column at the tactile surface and each having an annular
25 groove;

an elastic sheet member having second holes, each being arranged in correspondence with each of the first holes of the rotational member and each being engageable with the annular groove of the each of the tactile pins for pressing and
5 holding the each of the tactile pins with the rotational member,

wherein the each of the tactile pins is movable up-and-down in the each of the first and the second holes when a force exceeding a given value is applied to the each of the
10 tactile pins in up-and-down direction;

rotation driving means coupled to the rotational member for rotating the rotational member;

a pin height reset member provided nearby the rotational member for resetting the height of the tactile pins at a reset
15 height when the tactile pins are brought to contact with the pin height reset member during the rotation of the rotational member;

actuators provided nearby the rotational member for moving the tactile pins; and

20 selectively driving means coupled to the actuators for selectively driving the actuators to selectively move the tactile pins to be positioned at desired heights, respectively, relative to the tactile surface.

55. The tactile pin display apparatus according to claim
25 54, wherein the number of the actuators is equal to the number

of rows of tactile pins, and the actuators are driven at timings respectively different from each other.

56. A tactile pin display apparatus comprising:

5 a rotational member having a tactile surface and tactile pins to be movable up-and-down relative to the tactile surface;

a moving mechanism coupled to the tactile pins for moving the tactile pins up-and-down relative to the tactile surface; and

10 rotation driving means coupled to the rotational member, wherein photocatalytic function is provided to at least the rotational member or the tactile pins.

57. A braille display member having photocatalytic function on a surface thereof or inside thereof.